

CLAIMS

1. A liposome preparation comprising a unilamellar vesicle formed from a lipid bilayer comprising a phospholipid as the main membrane component, and an interior aqueous phase in the vesicle at a pH of up to 5, wherein the liposome has a drug loaded therein, and wherein the vesicle is modified with a hydrophilic macromolecule only on its exterior surface.

2. The liposome preparation according to claim 1, wherein the drug is the one which is unstable at a pH higher than 5.

3. The liposome preparation according to claim 1 or 2, wherein the drug loaded is at a concentration of 0.05 mole / mole lipid.

4. The liposome preparation according to claim 1 or 2, wherein the drug loaded is at a concentration of 0.1 mole / mole lipid.

5. The liposome preparation according to any one of claims 1 to 4, wherein the main membrane component is a phospholipid having a phase transition temperature of at

least 50°C.

6. The liposome preparation according to any one of claims 1 to 5, wherein the phospholipid is a hydrogenated phospholipid.

7. The liposome preparation according to any one of claims 1 to 5, wherein the phospholipid is a sphingophospholipid.

8. The liposome preparation according to any one of claims 1 to 7, wherein the lipid bilayer comprises a lipid other than the phospholipid as its membrane component.

9. The liposome preparation according to claim 6 or 7, wherein the lipid bilayer further comprises a cholesterol as its component.

10. The liposome preparation according to any one of claims 1 to 9, wherein the lipid bilayer further comprises a basic compound containing a group selected from amino group, amidino group, and guanidino group as its component.

11. The liposome preparation according to claim 10, wherein the basic compound is 3,5-dipentadecyloxybenzamidinium hydrochloride.

12. The liposome preparation according to any one of claims 1 to 11, wherein the hydrophilic macromolecule is polyethylene glycol having a molecular weight of 500 to 10,000 Dalton.

13. The liposome preparation according to any one of claims 1 to 12, wherein the hydrophilic macromolecule is introduced as a phospholipid or cholesterol derivative of the macromolecule.

14. The liposome preparation according to any one of claims 1 to 13, wherein the liposome preparation has an average size of 40 to 140 nm.

15. The liposome preparation according to any one of claims 1 to 13, wherein the liposome preparation has an average size of 50 to 130 nm.

16. The liposome preparation according to any one

of claims 1 to 13, wherein the liposome preparation has an average size of 60 to 120 nm.

17. The liposome preparation according to any one of claims 1 to 16, wherein the interior aqueous phase has a pH of 2 to 5.

18. A method for producing a liposome preparation of claim 1 comprising the steps of

preparing a vesicle having a unilamellar layer structure of a lipid bilayer containing a phospholipid so that the interior aqueous phase has a pH of up to 5;

adding a lipid derivative of the hydrophilic macromolecule to modify only the exterior surface of the vesicle; and

encapsulating the drug in the interior of the liposome either by preliminarily adding the drug to the interior aqueous phase in the course of the preparation of the vesicle, or alternatively, by adding the drug from the exterior of the vesicle after preparing the vesicle by penetration through the lipid bilayer.